ifm electronic

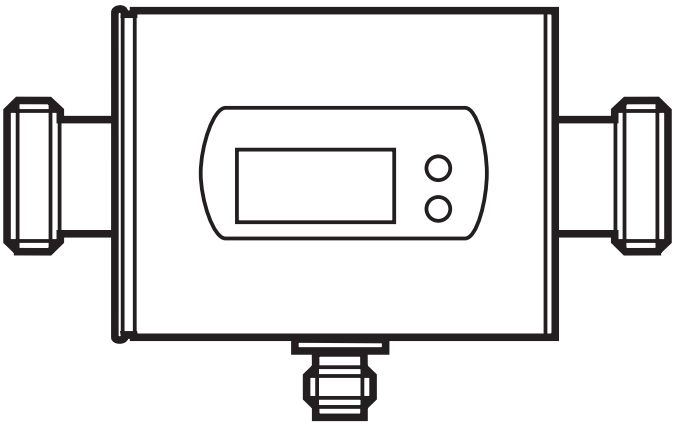
CE

Operating instructions
Magnetic-inductive flow sensor

efector300

SM6000

UK



704458 / 00 04 / 2010

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1 Preliminary note

1.1 Symbols used

▶ Instruction

> Reaction, result

[…] Designation of buttons, switches or indications

→ Cross-reference

Important note
Non-compliance can result in malfunctions or interference.

2 Safety instructions

- Please read this document prior to installing the unit. Ensure that the product is suitable for your application without any restrictions.
- Improper or non-intended use may lead to malfunctions of the unit or to unwanted effects in your application. That is why installation, electrical connection, set-up, operation and maintenance of the unit must be carried out by qualified personnel authorised by the plant operator.
- In all applications test the compatibility of the product materials (→ 12 Technical data) with the media to be measured.

For the scope of validity cULus:

The device shall be supplied from an isolating transformer having a secondary Listed fuse rated either

a) max 5 amps for voltages 0~20 Vrms (0~28.3 Vp) or

b) 100/Vp for voltages of 20~30 Vrms (28.3~42.4 Vp).

3 Functions and features

The unit monitors liquids.
It detects the 3 process categories volumetric flow, consumed quantity, medium temperature.

Application area
Conductive liquids with the following properties:
- conductivity: ≥ 20 µS/cm
- viscosity: < 70 mm^2/s at 40 °C

4 Function

4.1 Processing of the measured signals

- The unit displays the current process values.
- It generates 2 output signals according to the parameter setting.

OUT1: 3 selection options ..... parameter setting
switching signal for volumetric flow limit values ..... (→ 9.2.1)
or pulse sequence for totalising meter ..... (→ 9.3.1)
or switching signal for preset counter ..... (→ 9.3.2)

OUT2: 4 selection options
switching signal for volumetric flow limit value ..... (→ 9.2.2)
or switching signal for temperature limit value ..... (→ 9.4.1)
or analogue signal for volumetric flow ..... (→ 9.2.3)
or analogue signal for temperature ..... (→ 9.4.2)

OUT2 (pin 2) cannot only be used as an output
but also as an input for an external reset signal: ..... (→ 9.3.5)

4.2 Volumetric flow monitoring

The medium flows through a magnetic field. It generates a signal voltage which is directly proportional to the volumetric flow.

- 2 switching signals for volumetric flow limit values can be provided (output 1 and output 2). For the switching functions → 4.5.
- An analogue signal proportional to the volumetric flow (4...20 mA or 0...10 V) can be provided on output 2. For the analogue functions → 4.6.

In addition to the flow velocity, the unit also detects the flow direction. The positive flow direction is marked on the unit by an arrow (“flow direction” → 5.2).

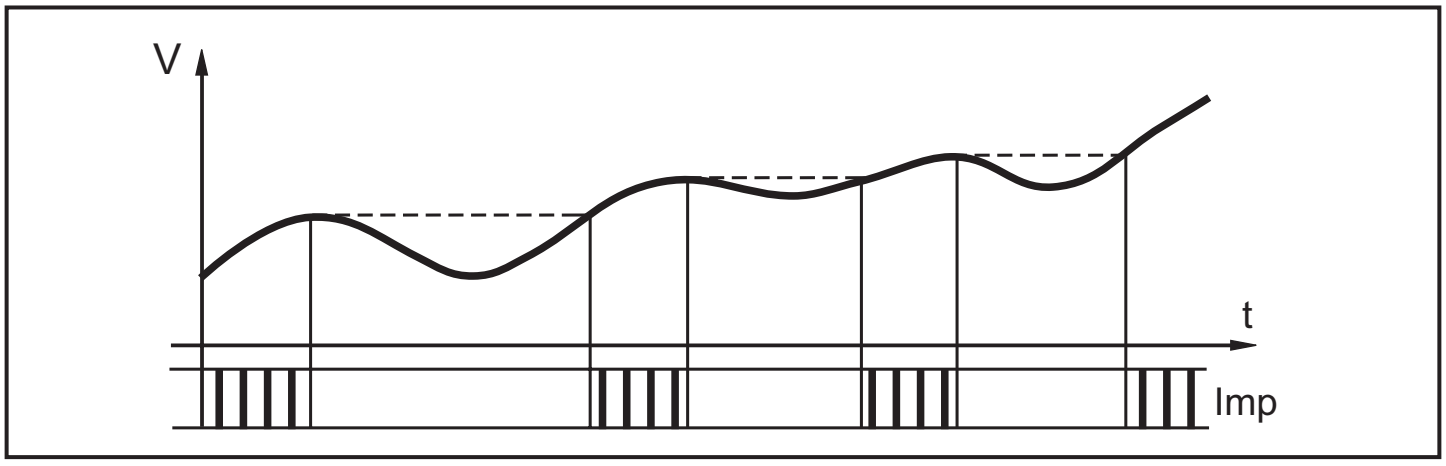
- Flow = “flow direction”: process value and display positive.
- Flow against the “flow direction”: process value and display negative.

Only positive process values are processed for the signal output (limit values and analogue values for volumetric flow).

4.3 Consumed quantity monitoring

The unit has an internal quantity meter which continuously totals the volumetric flow. The sum corresponds to the current consumed quantity since the last reset.

- The meter totals with the correct sign.
  Flow according to the flow direction marked by the arrow: meter totals.
  Flow against the marked flow direction: meter subtracts.
  Counting pulses are only provided as the sum increases. After subtraction (consumded quantity decreases) pulses are not provided again before the consumded quantity has exceeded the former maximum value.



V = volumetric flow quantity, Imp = output pulses

- The current meter count can be indicated.
- In addition the value before the last reset is stored. This value can also be indicated.
  The meter saves the totalled consumed quantity every 10 minutes. After a power failure this value is available as the current meter count. If a time-controlled reset is set, the elapsed time of the set reset interval is also stored. So the possible data loss can be maximum 10 minutes.

The meter can be reset as follows:

- Manual reset (→ 9.3.3).
- Time-controlled automatic reset (→ 9.3.3).
- External input signal on pin 2 (→ 9.3.5).

4.3.1 Consumed quantity monitoring with pulse output

Output 1 provides a counting pulse if the value set in [ImPS] is reached (→ 9.3.1).

4.3.2 Consumed quantity monitoring with preset meter

2 types of monitoring are possible:

- Time-dependent quantity monitoring
  - Settings: [ImPS] = quantity x, [ImPR] = [no], [rTO] = time t.
  - If the quantity x is reached during the time t, output 1 switches and remains switched until the meter is reset.
  - If the quantity x has not been reached after the time t, the meter is automatically reset and counting starts again; output 1 does not switch.
- Quantity monitoring not time-dependent
  - Settings: [ImPS] = quantity x, [ImPR] = [no], [rTO] = [OFF].
  - If the quantity x is reached, output 1 switches and remains switched until the meter is reset.

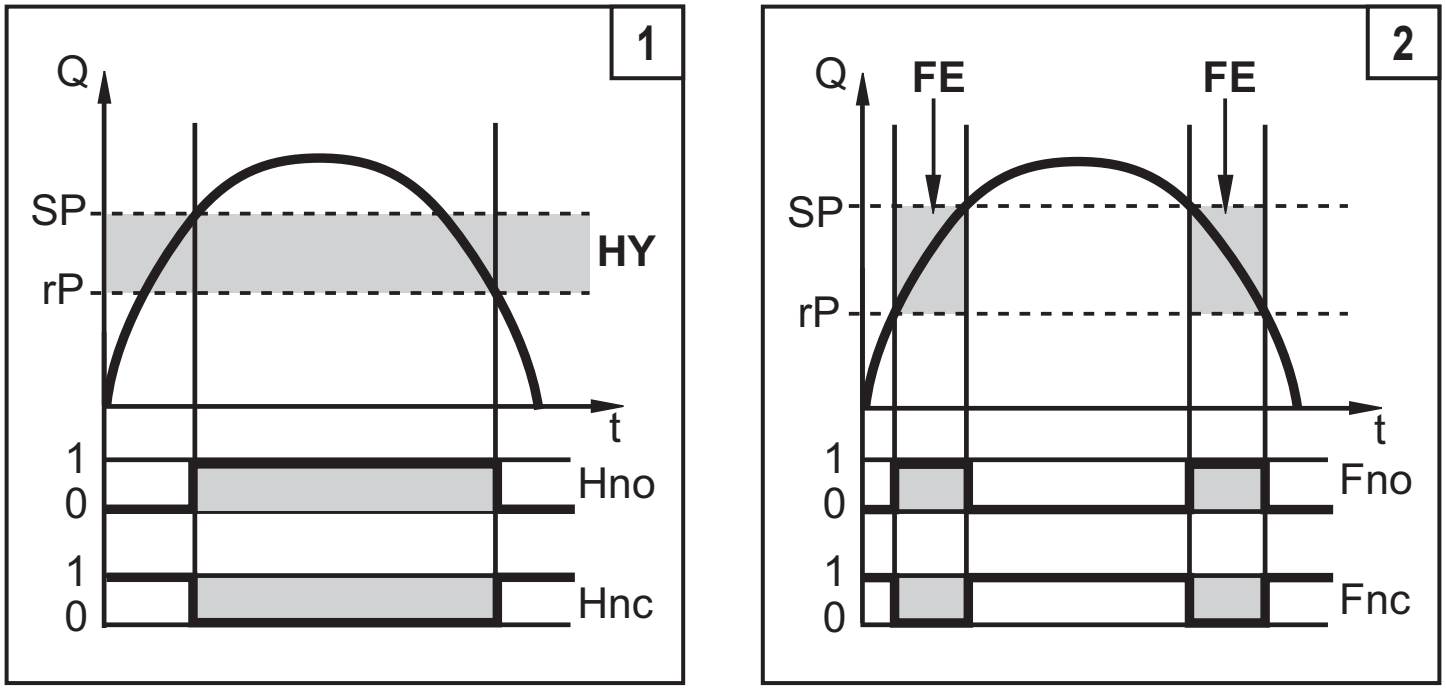
4.4 Monitoring of temperatures

- A switching signal for temperature limit values can be provided on output 2. For the switching functions → 4.5.
- An analogue signal proportional to the temperature (4...20 mA or 0...10 V) can be provided on output 2. For the analogue functions → 4.6.

4.5 Volumetric flow or temperature monitoring / switching function

OUTx changes its switching state if it is above or below the set switching limits (SPx, rPx). The following switching functions can be selected:

- Hysteresis function / normally open: [OUx] = [Hno].
- Hysteresis function / normally closed: [OUx] = [Hnc].
  First the set point (SPx) is set, then the reset point (rPx) at the requested distance.
- Window function / normally open: [OUx] = [Fno].
- Window function / normally closed: [OUx] = [Fnc].
  The width of the window can be set by means of the distance between SPx and rPx. SPx = maximum value, rPx = minimum value.



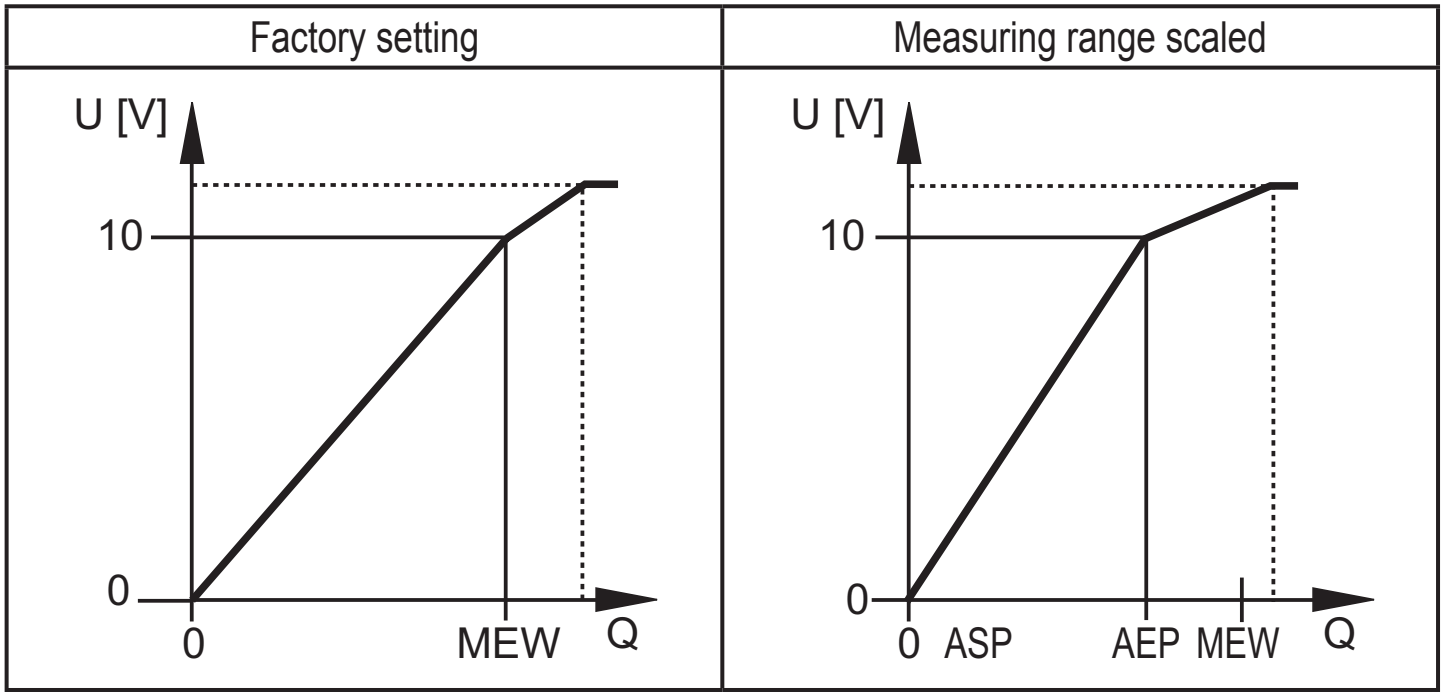
HY = hysteresis; FE = window; examples for volumetric flow monitoring

When set to the window function the set and reset points have a fixed hysteresis of 0.25 % of the final value of the measuring range. This keeps the switching state of the output stable if the volumetric flow varies slightly.

4.6 Volumetric flow or temperature monitoring / analogue function

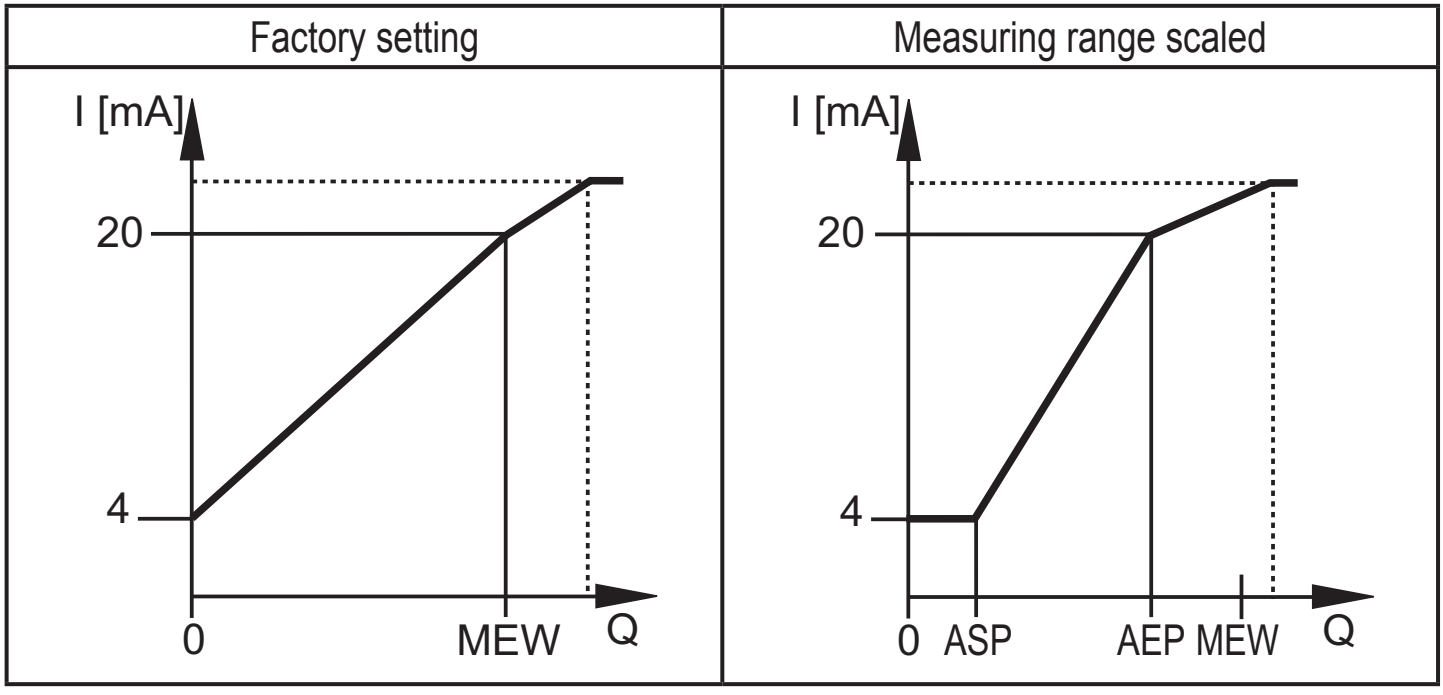
- The analogue start point [ASP] determines at which measured value the output signal is 4 mA or 0 V.
- The analogue end point [AEP] determines at which measured value the output signal is 20 mA or 10 V.
- Minimum distance between [ASP] and [AEP] = 20 % of the final value of the measuring range.

Voltage output 0 ... 10 V (example volumetric flow monitoring)



MEW = final value of the measuring range
In the set measuring range the output signal is between 0 and 10 V.
It is also indicated:
Volumetric flow above the measuring range: output signal > 10 V.

Current output 4 ... 20 mA (example volumetric flow monitoring)



MEW = final value of the measuring range
In the set measuring range the output signal is between 4 and 20 mA.
It is also indicated:
Volumetric flow above the measuring range: output signal > 20 mA.

4.7 Start-up delay [dSt]

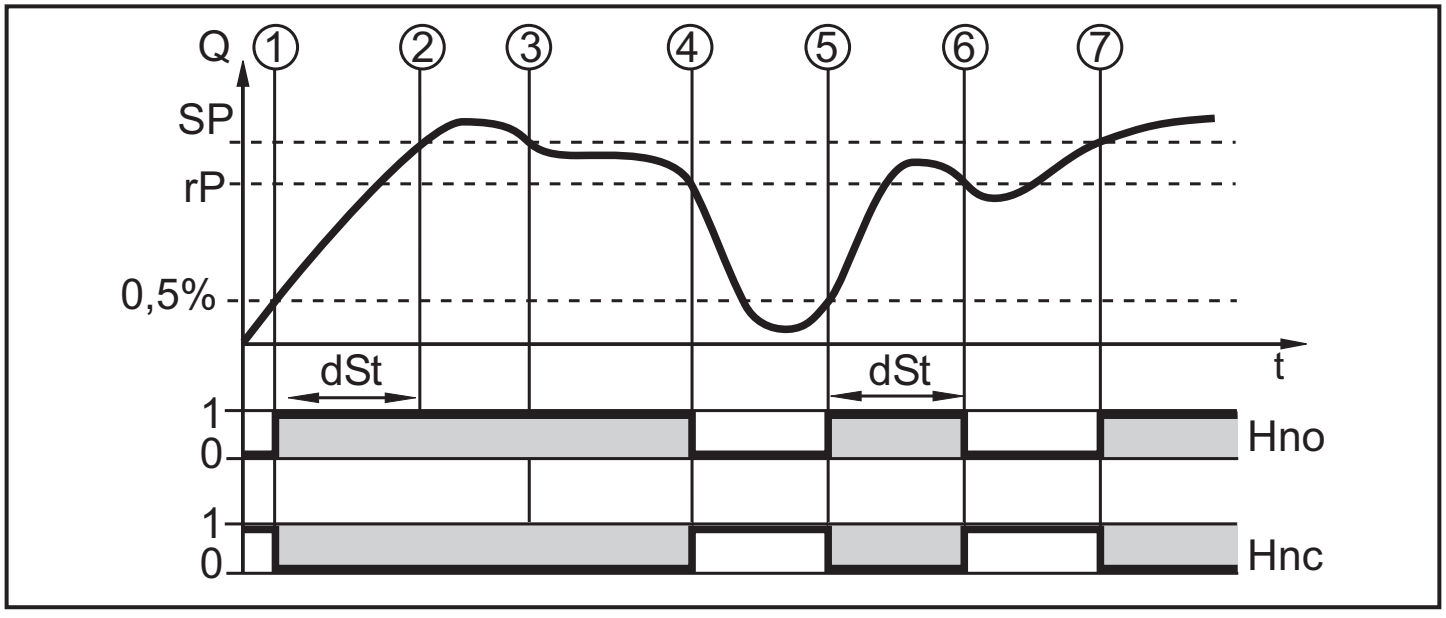
If the start-up delay is active ([dSt] > [0]), note: as soon as the volumetric flow quantity exceeds 0.5 % of the final value of the measuring range (VMR), the following processes are carried out:

- The start-up delay is activated.
- Output 1 switches as programmed: ON for NO function, OFF for NC function.
- Output 2 switches when the flow is evaluated ([SEL2] = [FLOW]) as programmed: ON for NO function, OFF for NC function).
- [dSt] only has an effect on the switching signals for volumetric flow monitoring.

After the activation of the start-up delay there are 3 options:

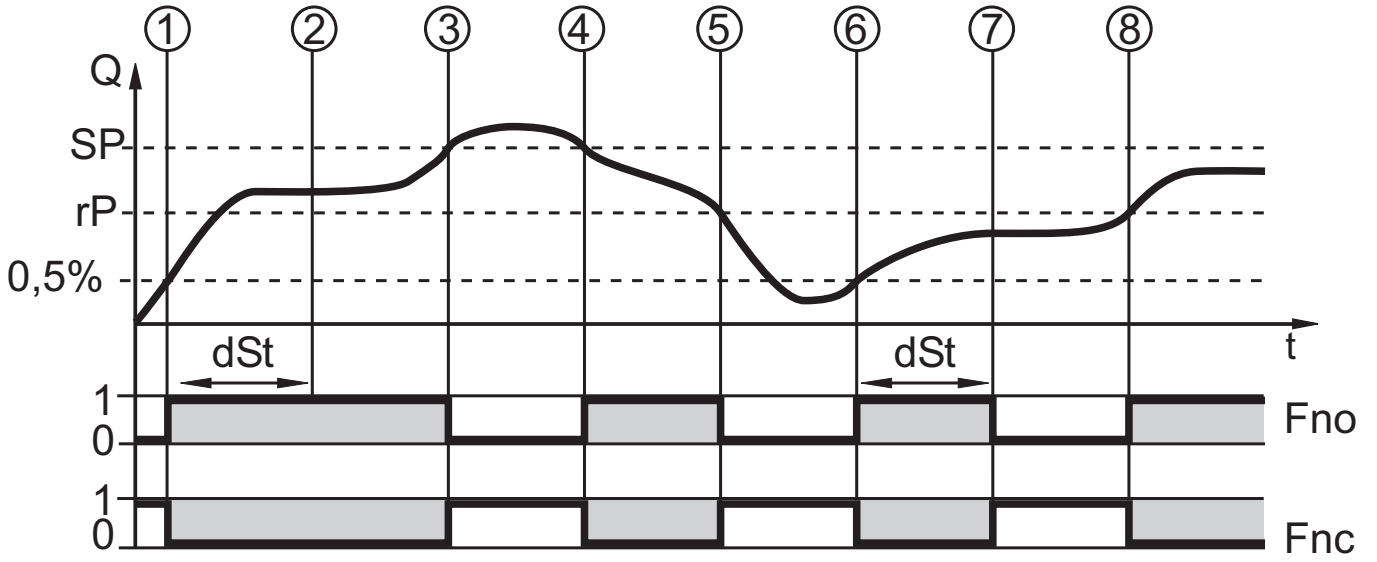
- The volumetric flow quantity increases quickly and reaches the switch point / good range within dSt → outputs remain active.
- The volumetric flow quantity increases slowly and does not reach the switch point / good range within dSt → outputs are reset.
- The volumetric flow quantity falls below 0.5 % within dSt → outputs are immediately reset; dSt is stopped.

Example: dSt for hysteresis function



1	Volumetric flow quantity Q reaches 0.5% of VMR → dSt starts, output becomes active.
2	dSt elapsed, Q reached SP → output remains active.
3	Q below SP, but above rP → output remains active.
4	Q below rP → output is reset.
5	Q reaches again 0.5 % of VMR → dSt starts, output becomes active.
6	dSt elapsed, Q has not reached SP → output is reset.
7	Q reaches SP → output becomes active.

Example: dSt for window function



1	Volumetric flow quantity Q reaches 0.5% of VMR → dSt starts, output becomes active.
2	dSt elapsed, Q reached good range → output remains active.
3	Q above SP (leaves good range) → output is reset.
4	Q again below SP → output becomes active again.
5	Q below rP (leaves good range) → output is reset again.
6	Q reaches again 0.5 % of VMR → dSt starts, output becomes active.
7	dSt elapsed, Q has not reached good range → output is reset.
8	Q reaches good range, output becomes active.

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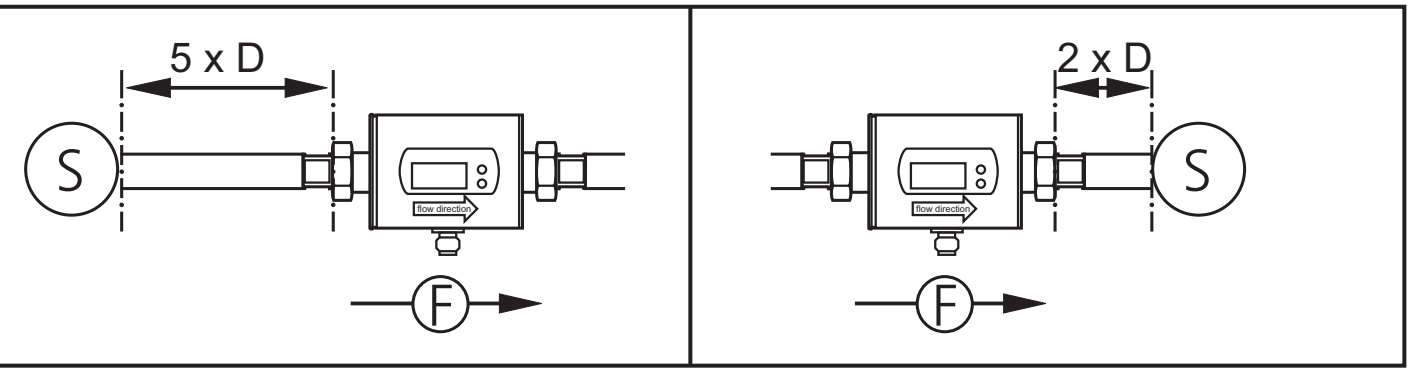
5 Installation

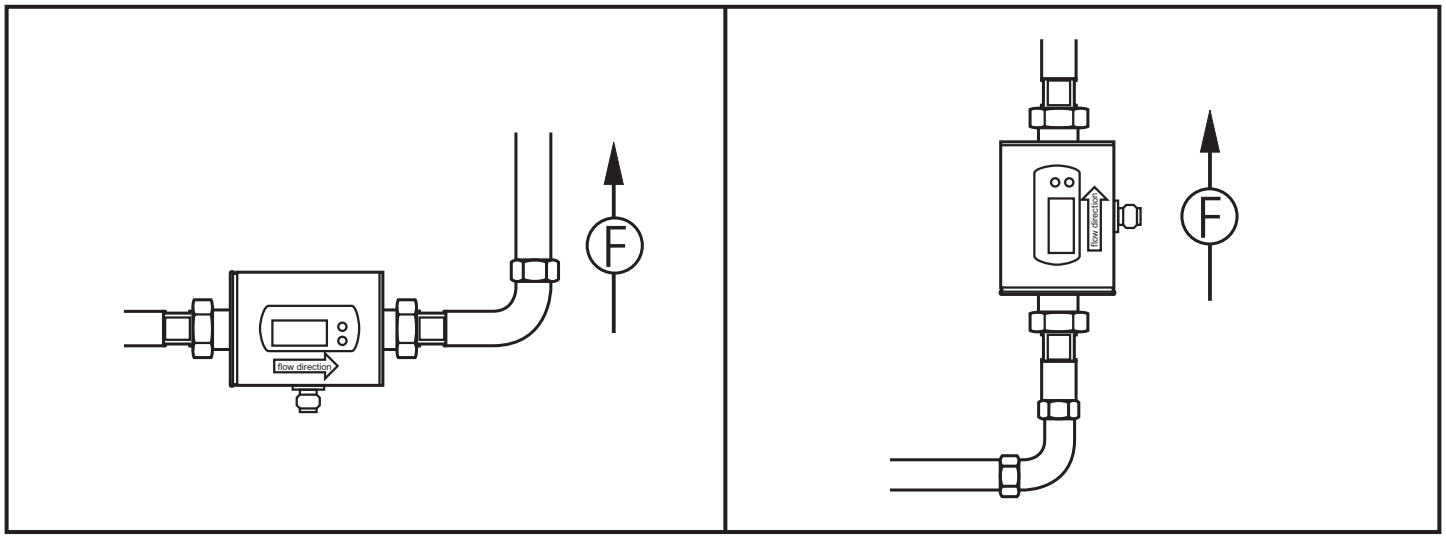
5.1 Installation location

- ▶ Install the unit so that the measuring pipe is always completely filled.
- ▶ Arrange for inlet and outlet pipe lengths. Disturbances caused by bends, valves, reductions, etc. are compensated for. It applies in particular: no shut-off and control devices are allowed directly in front of the unit.



S = disturbance; D = pipe diameter; F = flow direction

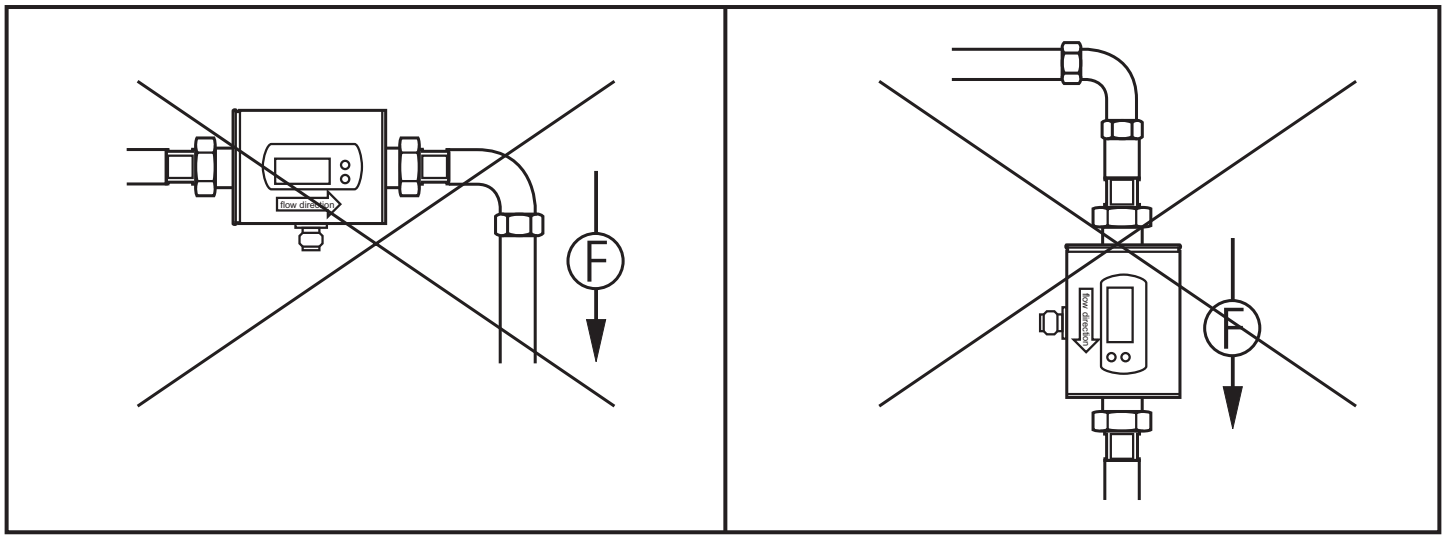
► Install in front of or in a rising pipe.



F = flow direction

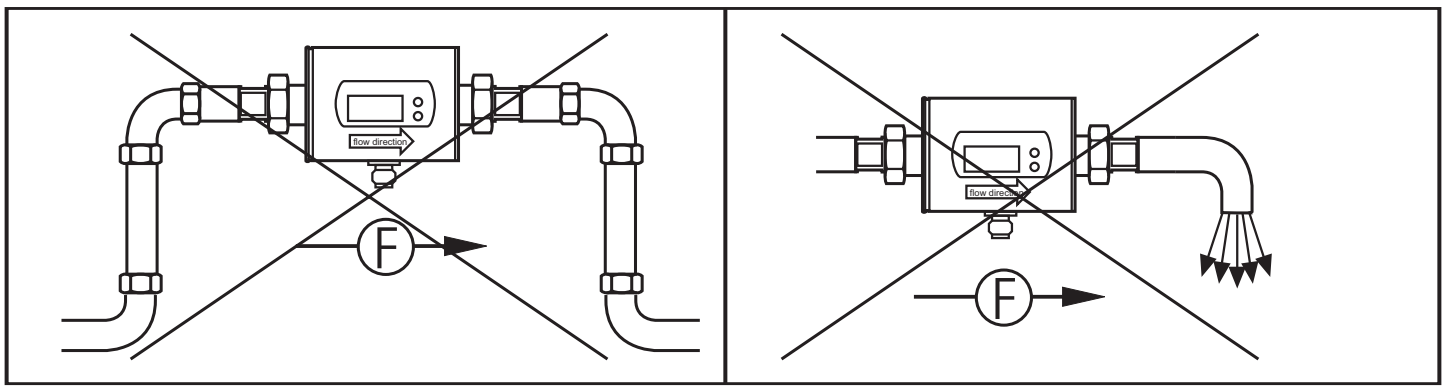
► Avoid the following installation locations:

- Directly in front of a falling pipe.
- In a falling pipe.



F = flow direction

- At the highest point of the pipe system.
- Directly in front of the spout of a pipe.

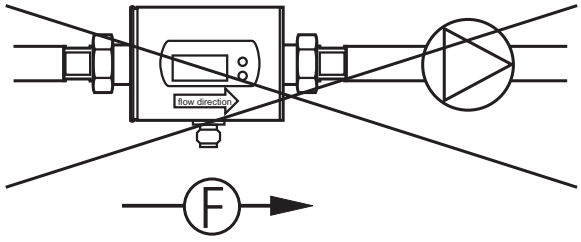


F = flow direction

The unit can be installed independently of the orientation if the following is ensured:

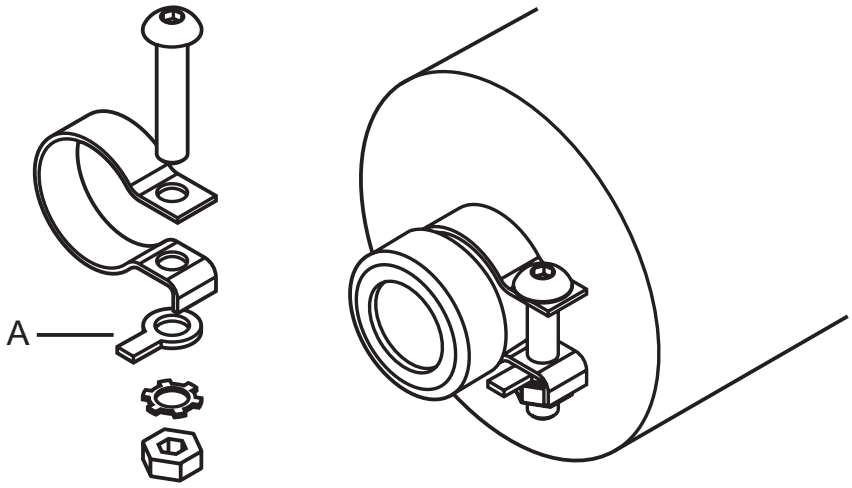
- No air bubbles can form in the pipe system.
- The pipes are always completely filled.

• On the suction side of a pump.



F = flow direction

If installed in an ungrounded pipe system (e.g. plastic pipes) the unit must be grounded.



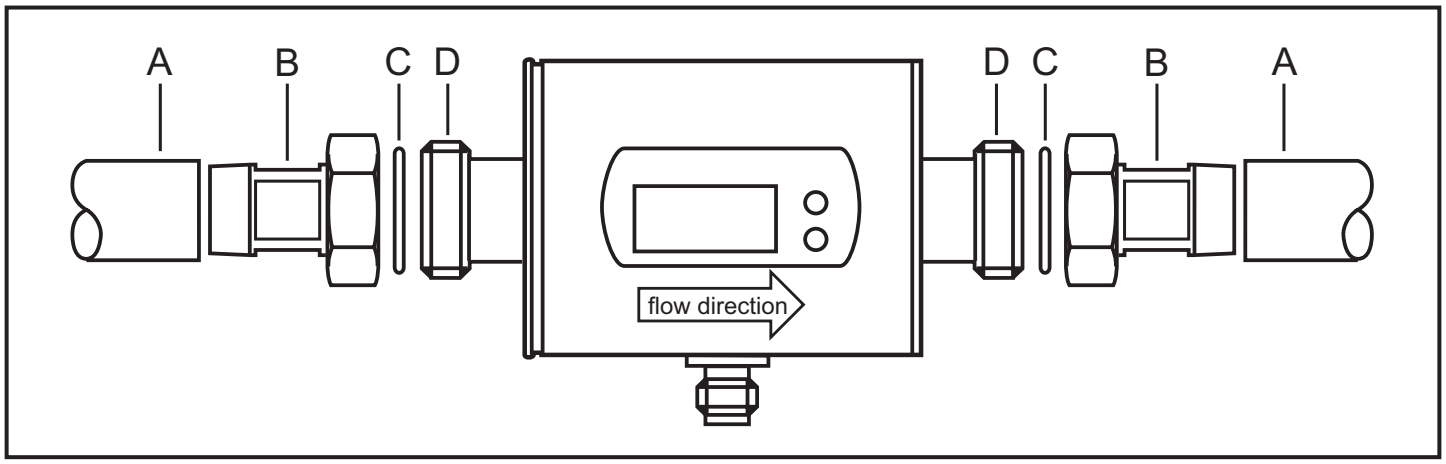
Ground brackets for the G½ thread are available as accessories (order number E40196).

A = cable lug (not included in the scope of supply).

5.2 Installation in pipes

The unit is installed in the pipe using adapters. Adapters have to be ordered separately as accessories.

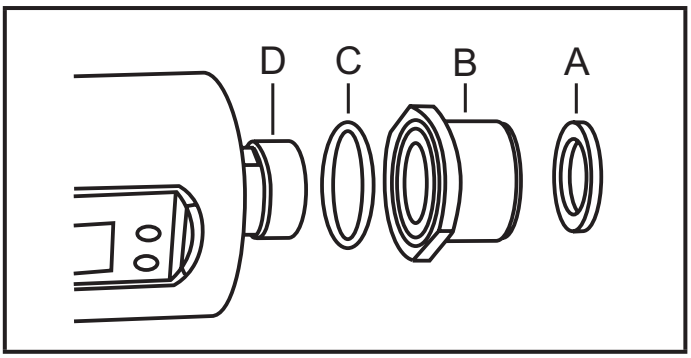
- Order no. E40199: 2 adapters for R½ pipes + 2 seals).



1. Screw the adapter (B) into the pipe (A).
2. Place the seals (C) and install the unit according to the marked flow direction.
3. Screw the adapter (B) with the threads (D) until it is hand-tight.
4. Tighten the two adapters in opposite direction (tightening torque: 30 Nm).

The unit can also be used in G¾ fittings. To do so, first screw an adapter G½ - G¾ (B) with O-ring (C) on both threads (D) of the unit.

Place the seals (A) and install the unit according to the marked flow direction.



Adapters have to be ordered separately as accessories.

- Order no. E40189: 2 adapters G½ - G¾ + 2 O-rings + 2 seals).

After installation air bubbles in the system can affect the measurement. Help:

► Rinse the system after installation for ventilation (rinsing quantity > 3 l/min.).

In cases of horizontal installation: As a result of design requirements a small quantity of the medium always remains in the measuring channel after switching off the pump.

5.3 Protection against high medium temperatures

For medium temperatures over 50 °C some parts of the housing can heat up to over 65 °C.

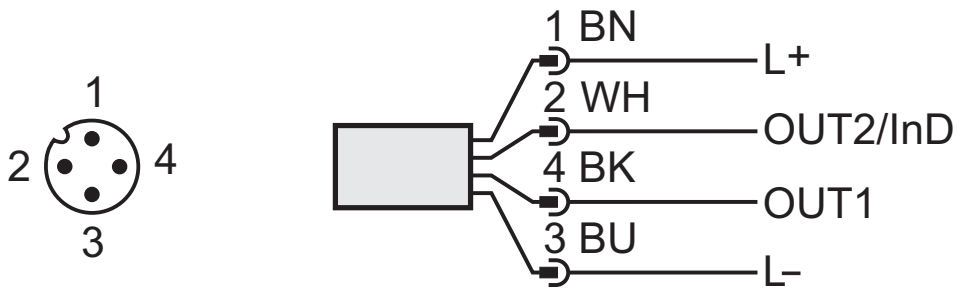
▶ Protect the housing against contact with flammable substances and unintentional contact.

6 Electrical connection

The unit must be connected by a qualified electrician.
The national and international regulations for the installation of electrical equipment must be adhered to.
Voltage supply to EN50178, SELV, PELV.

▶ Disconnect power.

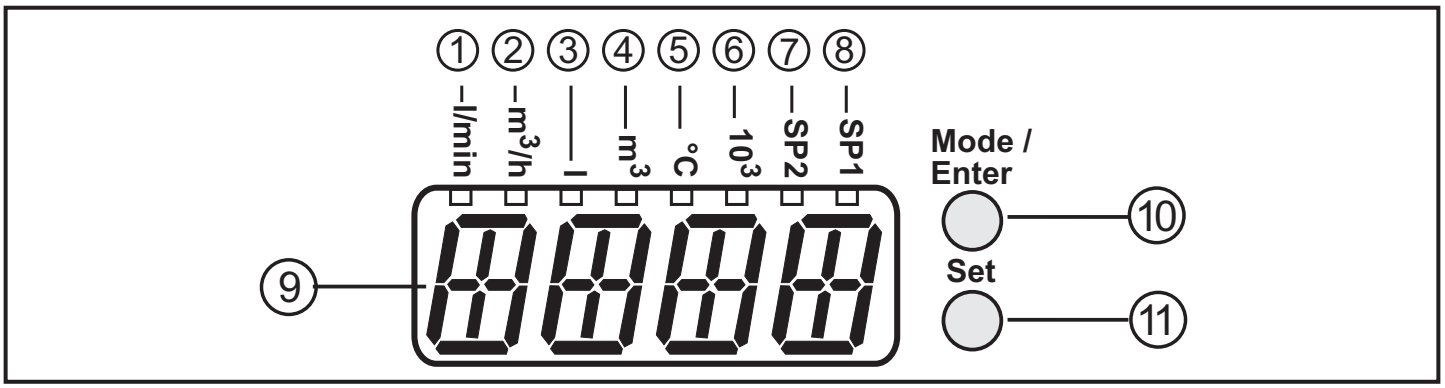
▶ Connect the unit as follows:



Pin1	Ub+
Pin3	Ub-
Pin4 (OUT1)	Switching signal: limit values for volumetric flow. Switching signal: quantity meter reached preset value. Pulses: 1 pulse every time the defined volumetric flow quantity is reached.
Pin2 (OUT2/InD)	Switching signal: limit values for volumetric flow. Switching signal: limit values for temperature. Analogue signal for volumetric flow. Analogue signal for temperature. Input for signal “meter reset”.

Core colours of ifm sockets:
1 = BN (brown), 2 = WH (white), 3 = BU (blue), 4 = BK (black)

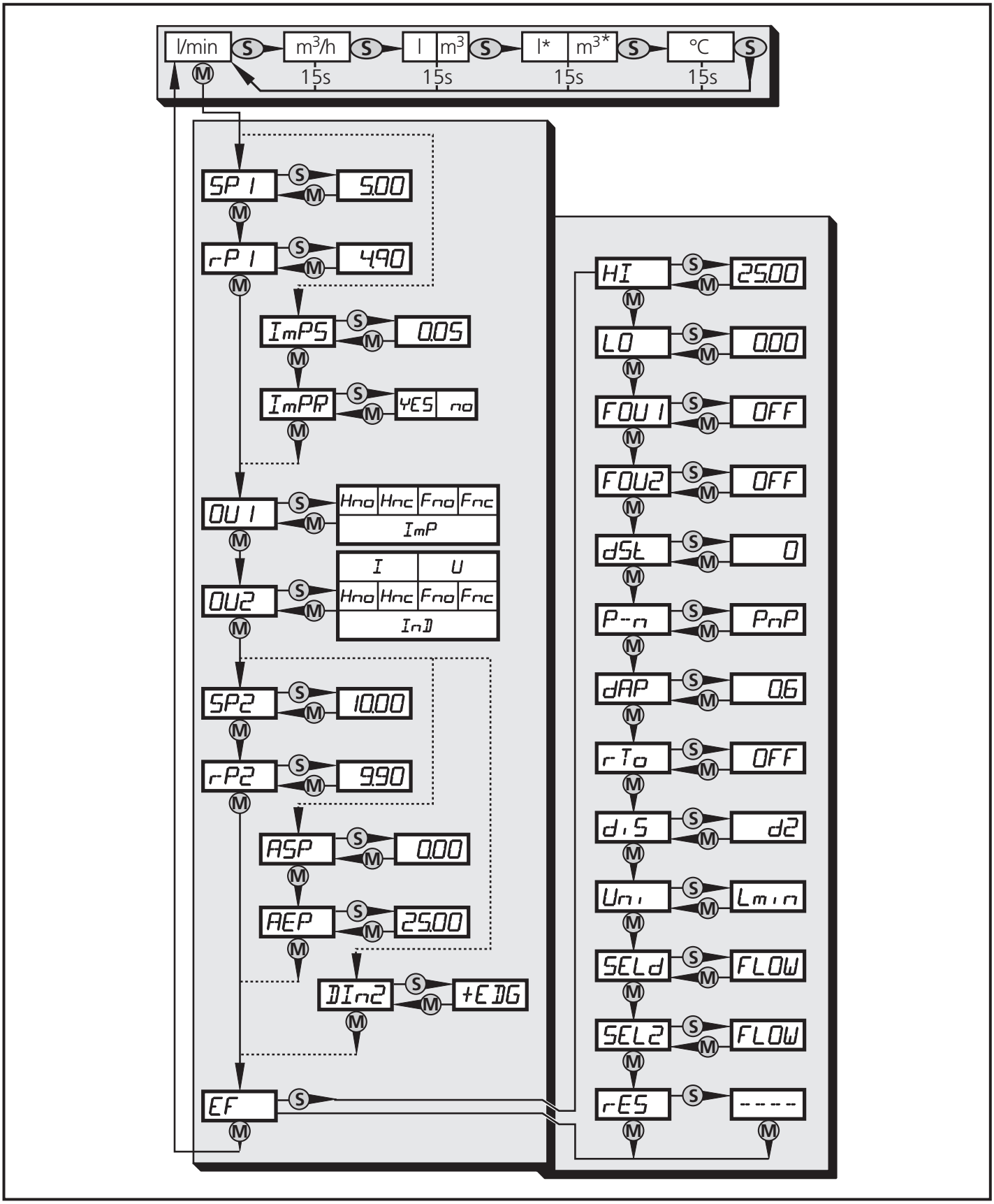
7 Operating and display elements



1 to 8: Indicator LEDs
- LED 1 = current volumetric flow in litres/minute. - LED 2 = current volumetric flow in cubic metres/hour. - LED 3 = current consumed quantity since the last reset in litres. - LED 3 flashing = consumed quantity before the last reset in litres. - LED 4 = current consumed quantity since the last reset in cubic metres. - LED 4 flashing = consumed quantity before the last reset in cubic metres. - LEDs 4 and 6 = current consumed quantity since the last reset in 10^3 cubic metres. - LEDs 4 and 6 flashing = consumed quantity before the last reset in 10^3 cubic metres. - LED 5 = current medium temperature in °C. - LED 7, LED 8 = switching state of the corresponding output.
9: Alphanumeric display, 4 digits
- Indication of the current volumetric flow (if [SELd] = [FLOW] is set). - indication of the meter count (if [SELd] = [TOTL] is set). - indication of the current medium temperature (if [SELd] = [TEMP] is set). - indication of the parameters and parameter values.
10: Mode/Enter pushbutton
- Selection of the parameters and acknowledgement of the parameter values.
11: Set pushbutton
- Setting of the parameter values (scrolling by holding pressed, incremental by pressing briefly). - Change of the display unit in the normal operating mode (Run mode).

8 Menu

8.1 Menu structure



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Ⓜ = **[Mode/Enter]** / Ⓢ = **[Set]**

l or m^3 = current meter count in l, m^3 or 1000 m^3

l* or m^3* = stored meter count in l, m^3 or 1000 m^3

8.2 Explanation of the menu

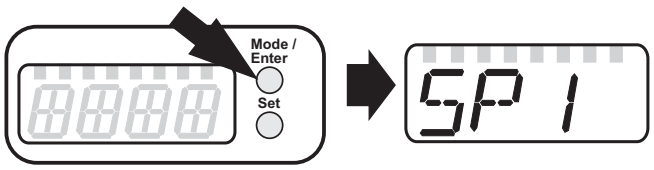
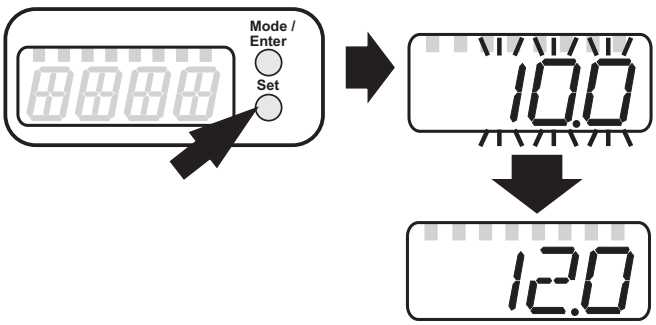
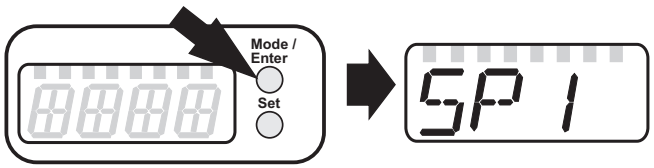
SP1/rP1	Maximum / minimum value for volumetric flow.
ImPS	Pulse value.
ImPR	Pulse repetition active (= pulse output) or not active (= function preset meter).
OU1	Output function for OUT1 (volumetric flow or consumed quantity): - Switching signal for limit values: hysteresis function or window function, normally open or normally closed. - Pulse or switching signal for quantity meter.
OU2	Output function for OUT2 (volumetric flow or temperature): - Switching signal for limit values: hysteresis function or window function, normally open or normally closed. - Analogue signal: 4-20 mA [I] or 0-10 V [U].
	As an alternative: configure OUT2 (pin 2) as input for the external reset signal: setting: [OU2] = [InD].
SP2/rP2	Maximum / minimum value for volumetric flow or temperature.
ASP	Analogue start value for volumetric flow or temperature.
AEP	Analogue end value for volumetric flow or temperature.
DIn2	Configuration of the input (pin 2) for meter reset.
EF	Extended functions / opening of menu level 2.
HI	Maximum value memory for volumetric flow.
LO	Minimum value memory for volumetric flow.
FOU1	Behaviour of output 1 in case of an internal fault.
FOU2	Behaviour of output 2 in case of an internal fault.
dSt	Start-up delay.
P-n	Output logic: pnp / npn.
dAP	Measured value damping / damping constant in seconds.
rTo	Meter reset: manual reset / time-controlled reset.
diS	Update rate and orientation of the display.
Uni	Standard unit of measurement for volumetric flow: litres/minute or cubic metres/hour.
SELd	Standard process category of the display: volumetric flow value / meter count / medium temperature.
SEL2	Standard process category for evaluation by OUT2: - Limit value signal or analogue signal for volumetric flow. - Limit value signal or analogue signal for temperature.
res	Restore factory setting.

9 Parameter setting

During parameter setting the unit remains in the operating mode. It continues its monitoring function with the existing parameters until the parameter setting has been completed.

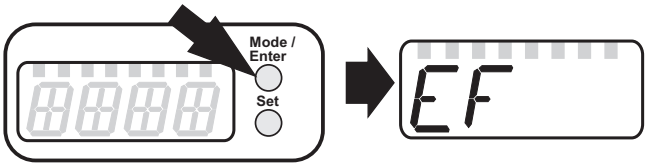
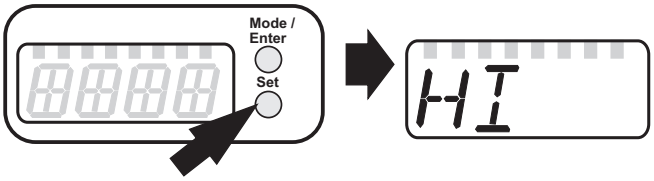
9.1 General parameter setting

3 steps must be taken for each parameter set:

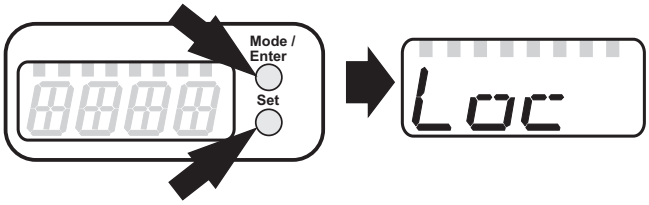
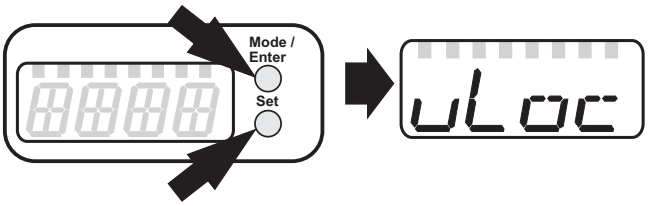
<table>
<tr><td>1</td><td>Parameter selection
▶ Press [Mode/Enter] until the requested parameter is displayed.</td><td> 
</td></tr>
<tr><td rowspan="2">2</td><td>Setting of the parameter value
▶ Press [Set] and keep it pressed.
> Current setting value of the parameter flashes for 5 s.
> After 5 s: The setting value is changed: incremental by pressing briefly or scrolling by holding pressed.</td><td> 
</td></tr>
<tr><td colspan="2">Numerical values are incremented continuously. If the value is to be reduced: let the display move to the maximum setting value. Then the cycle starts again at the minimum setting value.</td></tr>
<tr><td>3</td><td>Acknowledgement of the parameter value
▶ Press [Mode/Enter] briefly.
> The parameter is displayed again. The new setting value is stored.</td><td> 
</td></tr>
<tr><td colspan="3">Setting of other parameters:
▶ Start again with step 1.</td></tr>
<tr><td colspan="3">Finishing the parameter setting:
▶ Press [Mode/Enter] several times until the current measured value is displayed or wait for 15 s.
> The unit returns to the operating mode.</td></tr>
</table>

UK

- Change from menu level 1 to menu level 2:

▶ Press [Mode/Enter] until [EF] is displayed.	
▶ Press [Set] briefly. > The first parameter of the sub-menu is displayed (here: [HI]).	

- Locking / unlocking
  The unit can be locked electronically to prevent unintentional wrong settings.

▶ Make sure that the unit is in the normal operating mode. ▶ Press [Mode/Enter] + [Set] for 10 s. > [Loc] is displayed.	
During operation: > [Loc] is briefly displayed if you try to change parameter values.	
▶ Press [Mode/Enter] + [Set] for 10 s. > [uLoc] is displayed.	

When delivered: unlocked.

- Time out:

If during parameter setting no pushbutton is pressed for 15 s, the unit exits the parameter setting mode. The parameter value is not changed.

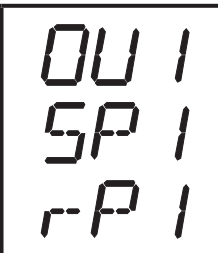
For medium temperatures over 50 °C some parts of the housing can heat up to over 65 °C.

In this case do not press the pushbuttons manually; instead use an object (e.g. ballpoint pen).

9.2 Settings for volumetric flow monitoring

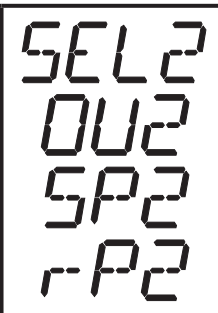
9.2.1 Settings for limit value monitoring with OUT1

- ▶ Select [OU1] and set the switching function:
  - [Hno] = hysteresis function/normally open,
  - [Hnc] = hysteresis function/normally closed,
  - [Fno] = window function/normally open,
  - [Fnc] = window function/normally closed.
- ▶ Select [SP1] and set the value at which the output switches.
- ▶ Select [rP1] and set the value at which the output switches back.



9.2.2 Settings for limit value monitoring with OUT2

- ▶ Select [SEL2] and set [FLOW].
- ▶ Select [OU2] and set the switching function:
  - [Hno] = hysteresis function/normally open,
  - [Hnc] = hysteresis function/normally closed,
  - [Fno] = window function/normally open,
  - [Fnc] = window function/normally closed.
- ▶ Select [SP2] and set the value at which the output switches.
- ▶ Select [rP2] and set the value at which the output switches back.



9.2.3 Scaling of the analogue value for volumetric flow

- ▶ Select [SEL2] and set [FLOW].
- ▶ Select [OU2] and set the function:
  - [I] = current signal proportional to volumetric flow (4…20 mA);
  - [U] = voltage signal proportional to volumetric flow (0…10 V).
- ▶ Select [ASP] and set the value at which the minimum output value is provided.
- ▶ Select [AEP] and set the value at which the maximum output value is provided.

9.3 Settings for monitoring of consumed quantities

9.3.1 Settings for quantity monitoring by pulse output

- ▶ [Select [OU1] and set [ImP].
- ▶ Select [ImPS] and set the volumetric flow quantity at which 1 pulse is provided (→ 9.7).
- ▶ Select [ImPR] and set [YES]: pulse repetition is active. Output 1 provides a counting pulse when the value set in [ImPS] is reached.

9.3.2 Settings for quantity monitoring using the preset meter

- ▶ Select [OU1] and set [ImP].
- ▶ Select [ImPS] and set the volumetric flow quantity at which output 1 switches (→ 9.7).
- ▶ Select [ImPR] and set [no]: pulse repetition is not active. The output switches ON if the value set in [ImPS] is reached. It remains switched until the meter is reset.

9.3.3 Settings for meter reset controlled by the program

- ▶ Select [rTO] and continue with a) or b).
  a) Reset the meter manually: press [Set] until [rES.T] is displayed. Press [Mode/Enter] briefly.
  b) Enter the value for time-controlled reset: Press [Set] until the requested value is displayed (intervals from 1 hour to 8 weeks).
- ▶ Press [Mode/Enter] briefly.

9.3.4 Switch off the meter reset

- ▶ Select [rTO] and set [OFF]. The meter is only reset after overflow (= factory setting).

9.3.5 Settings for meter reset by an external signal

- ▶ Select [OU2] and then [InD].
- ▶ Select [Din2] and set the reset signal:
  - [Hi] = reset for high signal,
  - [Lo] = reset for low signal,
  - [+EDG] = reset for rising edge,
  - [-EDG] = reset for falling edge.

9.4 Settings for temperature monitoring

9.4.1 Settings for limit value monitoring with OUT2

- ▶ Select [SEL2] and set [TEMP].
- ▶ Select [OU2] and set the switching function:
  - [Hno] = hysteresis function/normally open,
  - [Hnc] = hysteresis function/normally closed,
  - [Fno] = window function/normally open,
  - [Fnc] = window function/normally closed.
- ▶ Select [SP2] and set the value at which the output switches.
- ▶ Select [rP2] and set the value at which the output switches back.

9.4.2 Scaling of the analogue value for temperature

▶ Select [SEL2] and set [TEMP]. ▶ Select [OU2] and set the function: - [I] = current signal proportional to temperature (4…20 mA); - [U] = voltage signal proportional to temperature (0…10 V). ▶ Select [ASP] and set the value at which the minimum output value is provided. ▶ Select [AEP] and set the value at which the maximum output value is provided.	

9.5 User settings (optional)

9.5.1 Determine the standard unit of measurement for volumetric flow

▶ Select [Uni] and set the unit of measurement: [Lmin] or [m3h]. The setting only has an effect on the volumetric flow value. The counter values (consumed quantity) are automatically displayed in the unit of measurement (l or m3) providing the highest accuracy.	

9.5.2 Configuration of the standard display

▶ Select [SELd] and determine the standard process category. - [FLOW] = display shows the current volumetric flow value in the standard unit of measurement. - [TOTL] = display indicates the current meter count in l, m^3 or 1000 m^3. - [TEMP] = display indicates the current medium temperature in °C. ▶ Select [diS] and determine the update rate and orientation of the display: - [d1] = update of the measured values every 500 ms. - [d2] = update of the measured values every 1000 ms. - [d3] = update of the measured values every 2000 ms. - [rd1], [rd2], [rd3] = display as for d1, d2, d3; rotated by 180°. - [OFF] = the display is switched off in the operating mode.	

9.5.3 Setting the output logic

▶ Select [P-n] and set [PnP] or [nPn].	

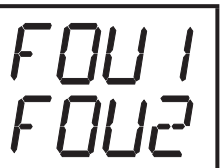
9.5.4 Setting the start-up delay

▶ Select [dSt] and set the numerical value in seconds.	

9.5.5 Setting the damping of the measured values

▶ Select [dAP] and the damping constant in seconds (t value 63 %).	

9.5.6 Setting the error behaviour of OUT1 / OUT2

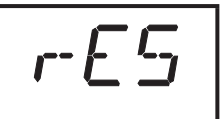
▶ Select [FOU1] and determine the value: - [On] = output 1 switches ON in case of an error. - [OFF] = output 1 switches OFF in case of an error. - [OU1] = output 1 switches irrespective of the error as defined with the parameters. ▶ Select [FOU2] and determine the value: - [On] = output 2 switches ON in case of an error, the analogue signal goes to the upper end stop value. - [OFF] = output 2 switches OFF in case of an error, the analogue signal goes to the lower end stop value. - [OU2] = output 2 switches irrespective of the error as defined with the parameters. The analogue signal corresponds to the measured value.	

9.6 Service functions

9.6.1 Reading the min./max. values for volumetric flow

▶ Select [HI] or [LO] and press [Set] briefly. [HI] = maximum value, [LO] = minimum value. Delete memory: ▶ Select [HI] or [LO]. ▶ Press [Set] and keep it pressed until [----] is displayed. ▶ Press [Mode/Enter] briefly. It makes sense to delete the memories as soon as the unit works under normal operating conditions for the first time.	

9.6.2 Reset all parameters to the factory setting

▶ Select [rES], then press [Set] and keep it pressed until [----] is displayed. ▶ Press [Mode/Enter] briefly. The factory setting is listed at the end of the instructions (→ 13 Factory setting). It makes sense to write your own settings in this table before executing the function.	

9.7 Setting of the preset meter / pulse value (ImPS)

7 setting ranges are available:

	LED	Display	Value	Resolution
1	3	0 0. 0 5 ... 9 9. 9 9	0.05...99.99 l	0.01 l
2	3	1 0 0. 0 ... 9 9 9. 9	100.0...999.9 l	0.1 l
3	3	1 0 0 0 ... 9 9 9 9	1000...9999 l	1 l
4	4	1 0. 0 0 ... 9 9. 9 9	10.00...99.99 m³	0.01 m³
5	4	1 0 0. 0 ... 9 9 9. 9	100.0...999.9 m³	0.1 m³
6	4	1 0 0 0 ... 9 9 9 9	1000...9999 m³	1 m³
7	4 + 6	1 0. 0 0 ... 3 0. 0 0	10 000...30 000 m³	10 m³

UK

Setting operation:

▶ Set [OU1] to [ImP] (→ 9.3.2).

▶ Press [Mode/Enter] until [ImPS] is displayed.

▶ Press [Set] and keep it pressed.

> The current numerical value flashes for 5 s, then the first of the 4 digits becomes active (digit flashes, can be changed).

▶ Set the requested value as indicated in the following table.

▶ First select the requested setting range. Then set the figure from the left digit to the right digit.

▶ Press [Mode/Enter] briefly when all 4 digits are set.

As soon as the first digit flashes there are 3 options:

▶ Press [Set] once.	The flashing digit is increased. 9 is followed by 0 - 1 - 2, etc. 8 1. 2 3 1 x [Set] pressed 9 1. 2 3 1 x [Set] pressed 0 1. 2 3 1 x [Set] pressed 1 1. 2 3

<table>
<tr><td rowspan="2">▶ Press [Set] and keep it pressed.</td><td>The flashing digit is increased, 9 is followed by 0 and the digit following on the left becomes active.
8 1. 8 3
[Set] permanently pressed 8 1. 9 3
[Set] kept pressed 8 1. 0 3</td></tr>
<tr><td>If digit 1 is increased this way, the display changes to the next higher setting range (9 is followed by 10, the decimal point is moved one place to the right or the LED display changes).
8 1. 2 3
[Set] permanently pressed 9 1. 2 3
[Set] kept pressed 1 0 1. 2</td></tr>
<tr><td rowspan="2">▶ Wait 3 s (do not press any button).</td><td>The digit following on the right flashes (= becomes active).
8 1 2. 3
no pushbutton pressed; after 3 s 8 1 2. 3
after 3 s 8 1 2. 3
after 3 s 8 1 2. 3</td></tr>
<tr><td>If the fourth digit flashes unchanged for 3 s, digit 1 becomes active again (if the value of digit 1 is > 0).
after 3 s 8 1 2. 3
If digit 1 has the value “0”, the display changes to the next lower setting range (the decimal point is moved one place to the left or the LED display changes).
0 1 2. 3
after 3 s 1 2. 3 0
Next: Change digit 4 or wait 3 s and set digit 1.
after 3 s 1 2. 3 0</td></tr>
</table>

Highlighted grey (**1**) = flashing digit.

Note: If [Set] is pressed continuously, the display moves through all setting ranges; after the end value it jumps back to the start value. Release [Set] briefly and start the setting again.

10 Operation

After power on and expiry of the power-on delay time (approx. 5 s) the unit is in the Run mode (= normal operating mode). It carries out its measurement and evaluation functions and generates output signals according to the set parameters.

- During the power-on delay time the outputs are switched as programmed: ON for NO function (Hno / Fno) and OFF for NC function (Hnc / Fnc).
- If output 2 is configured as analogue output, the output signal is at the maximum value during the power-on delay time.

10.1 Read the set parameters

▶ Press [Mode/Enter] until the requested parameter is displayed.
▶ Press [Set] briefly.
> The unit displays the corresponding parameter value for about 15 s. After another 15 s the unit returns to the Run mode.

10.2 Changing the display unit in the Run mode

▶ Press [Set] briefly in the Run mode. Press the pushbutton to move to the next display unit.
> The unit displays the current measured value for approx. 15 s, the corresponding LED lights.

10.3 Error indication

[SC1]	Short circuit in OUT1.
[SC2]	Short circuit in OUT2.
[SC]	Short circuit in both outputs.
[OL]	Detection zone of volumetric flow or temperature exceeded: measured value between 120 % and 130 % of VMR.
[UL]	Below the detection zone of volumetric flow or temperature: measured value between -120 % and -130 % of VMR.
[Err]	- Unit faulty / malfunction. - Measured value greater than 130 % of VMR or smaller than -130 % of VMR.
[Loc]	Setting pushbuttons locked, parameter change rejected.

VMR = final value of the measuring range

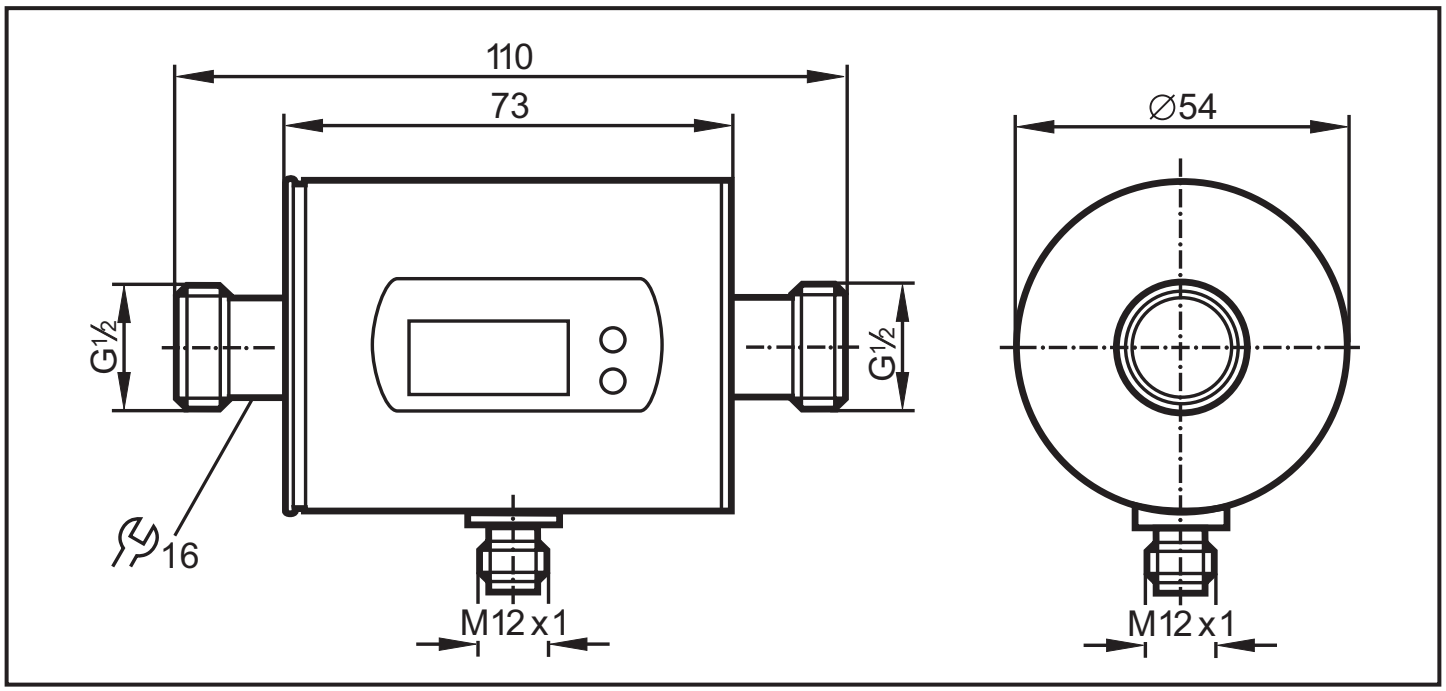
10.4 General operating conditions

▶ Avoid deposits, accumulated gas and air in the pipe system.

For medium temperatures over 50 °C some parts of the housing can heat up to over 65 °C.

▶ In this case do not touch the unit.
▶ Protect the housing against contact with flammable substances and unintentional contact.
▶ Do not press the pushbuttons manually; instead use an object (e.g. ballpoint pen).

11 Scale drawing



Dimensions are in millimeters

12 Technical data

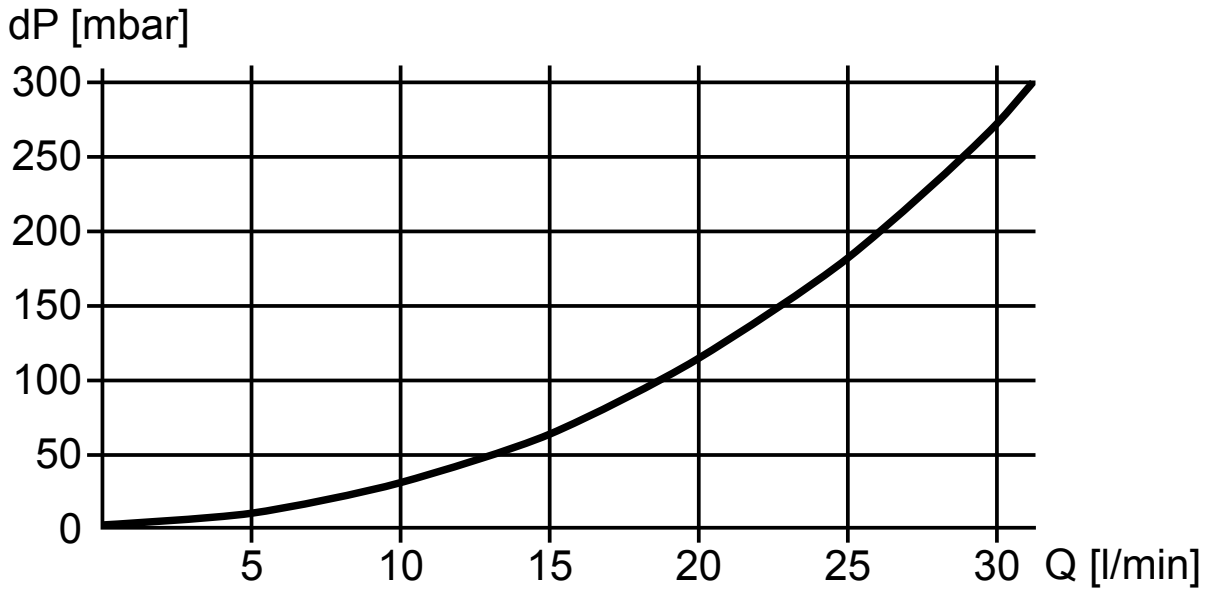
Application	conductive liquids
Conductivity	≥ 20 µS/cm
Viscosity	< 70 mm²/s at 40°C

Operating voltage [V]	19...30 DC[1)]
Current rating [mA]	2 x 200; protection: short circuit, reverse polarity, overload
Voltage drop [V]	< 2
Current consumption typ. [mA]	120
Analogue output	4...20 mA / 0...10 V; measuring range scaleable
Max. load current output [Ω]	500
Min. load for voltage output [kΩ]	2
Pulse value	0.05 l...30 000 m³
Pulse length [s]	min. 0.05 / max. 2
Power-on delay time [s]	5

Flow monitoring

Measuring range [l/min / m³/h]	0.1...25 / 0.05...1.5
Resolution [l/min / m³/h]	0.05 / 0.005
Display range [l/min / m³/h]	-30...30 / -1.8...1.8
Response time [ms]	< 150 (dAP = 0)
Damping flow signal (dAP) [s]	0.0...5.0
Start-up delay [s]	0...50
Accuracy	< ± (2% MV + 0.5% VMR)
Repeatability [% VMR]	± 0.2

Pressure loss (dP) / flow rate (Q)



UK

Temperature monitoring	
Measuring range [°C]	-20...80
Response time [s]	T09 = 30 (Q > 1 l/min)
Resolution [°C]	0.2
Accuracy [°C]	± 2.5 (Q > 1 l/min)
Operating temperature [°C]	-10...60
Medium temperature [°C]	-10...70
Pressure resistance [bar]	16
Material (wetted parts)	stainless steel (316S12); PEEK; FKM
Housing materials	stainless steel (316S12); PBT-GF 20; PC (Makrolon); EPDM/X (Santoprene)
Protection	IP 67 / III
Insulation resistance [MΩ]	> 100 (500 V DC)
Shock resistance [g]	20 (DIN / IEC 68-2-27, 11ms)
Vibration resistance [g]	5 (DIN / IEC 68-2-6, 55 - 2000 Hz)
EMC	
IEC 1000/4/2 ESD:	4 / 8 KV
IEC 1000/4/3 HF radiated:	10 V/m
IEC 1000/4/4 Burst:	2 KV
IEC 1000/4/5 Surge:	0.5 / 1 KV
IEC 1000/4/6 HF conducted:	10 V

[1)] to EN50178, SELV, PELV

MV = measured value; VMR = final value of the measuring range

12.1 Setting ranges

FLOW	SP1 / SP2		rP1 / rP2		ASP		AEP		ΔQ
	min	max	min	max	min	max	min	max	
l/min	0.25	25.00	0.10	24.90	0.00	20.00	5.00	25.00	0.05
m^3h	0.015	1.500	0.005	1.495	0.000	1.200	0.300	1.500	0.005

TEMP	SP2		rP2		ASP		AEP		ΔT
	min	max	min	max	min	max	min	max	
°C	-19.2	80.0	-19.6	79.6	-20.0	60.0	0.0	80.0	0.2

ImPS	min	max
	0.05 l	30 000 m^3

(ΔQ, ΔT = step increment)

13 Factory setting

	Factory setting	User setting
SP1	5.00	
rP1	4.90	
ImPS	0.05	
ImPR	YES	
OU1	Hno	
OU2	I	
SP2 (FLOW)	10.00	
rP2 (FLOW)	9.90	
SP2 (TEMP)	20.0	
rP2 (TEMP)	19.6	
ASP (FLOW)	0.00	
AEP (FLOW)	25.00	
ASP (TEMP)	-20.0	
AEP (TEMP)	80.0	
DIn2	+EDG	
FOU1	OFF	
FOU2	OFF	
dSt	0	
P-n	PnP	
dAP	0.6	
rTo	OFF	
diS	d2	
Uni	Lmin	
SELd	FLOW	
SEL2	FLOW	

Further information at www.ifm.com